

CHAPTER 5

GUIDED MISSILE M6

Section I. PHYSICAL DESCRIPTION

44 (U). General

The NIKE-HERCULES missile, designated guided missile M6, consists of the missile body and the rocket motor cluster. Guided missile M6, mounted on a launching-handling rail, is shown erected on a Hercules monorail launcher in figure 39. The overall length of guided missile M6 is approximately 39 feet and the gross weight is approximately 10,550 pounds.

45 (U). Missile Body

a. *General.* The missile body (fig. 40) consists of a forward body section, a warhead body section, a rear body section, and four main fins. The missile body is approximately 27 feet long and the gross weight is approximately 5250 pounds. The maximum body diameter is 31.5 inches and the fin span is 90 inches.

b. *Forward Body Section.* The forward body section (fig. 40) contains the transponder-control group (1, fig. 41), the major component of the missile guidance set. Four forward fins (fig. 40) are positioned at 90-degree intervals around the circumference of the forward body section. The antenna horns (2, fig. 41) of the missile guidance set are mounted in the forward fins.

c. *Warhead Body Section.* The warhead body section (fig. 40) contains the warhead (3, figure 41) and associated equipment.

d. *Rear Body Section.* The rear body section (fig. 40) consists of the missile motor section, the equipment section, and the actuator

section. The missile motor section contains the major portion of missile rocket motor M30 (4, fig. 41) and associated equipment. The equipment section contains the missile batteries and either an accessory power supply (5, fig. 41) or a hydraulic pumping unit. The actuator section contains the actuator assemblies and mechanical linkage that move the elevons. The blast tube (6, fig. 41) of missile rocket motor M30 extends through the equipment section and the actuator section to an opening in the rear of the actuator section.

e. *Main Fins and Elevons.* The four main fins (fig. 40) are positioned at 90-degree intervals around the circumference of the missile body. The main fins extend from the forward end of the warhead body section to the forward end of the actuator section. The four elevons are hinged to the trailing edges of the main fins and are connected to the mechanical linkage in the actuator section.

46 (U). Rocket Motor Cluster

The rocket motor cluster (fig. 40) consists of a cluster of four rocket motors M5E1, a rocket motor thrust ring, and four rocket motor cluster fins. When assembled to the missile body, the rocket motor cluster fits over the actuator section of the missile body. The overall length of the cluster is approximately 14 feet and the gross weight is approximately 5300 pounds. The maximum width (less fins) is 84 inches and the fin span is 138 inches.

Section II. FUNCTIONAL DESCRIPTION

47 (U). Aerodynamic Configuration

Guided missile M6 is an aerodynamic, supersonic missile with a symmetrical cruciform configuration. Because the center of gravity is located slightly forward of the center of pressure, the missile is inherently stable about

the pitch and yaw axes. The symmetrical airfoil section of the main fins is such that an increase in the angle of attack produces a rearward movement of the center of pressure, further increasing stability and permitting operation over a wide range of velocities and missile attitudes. In addition, the symmetrical

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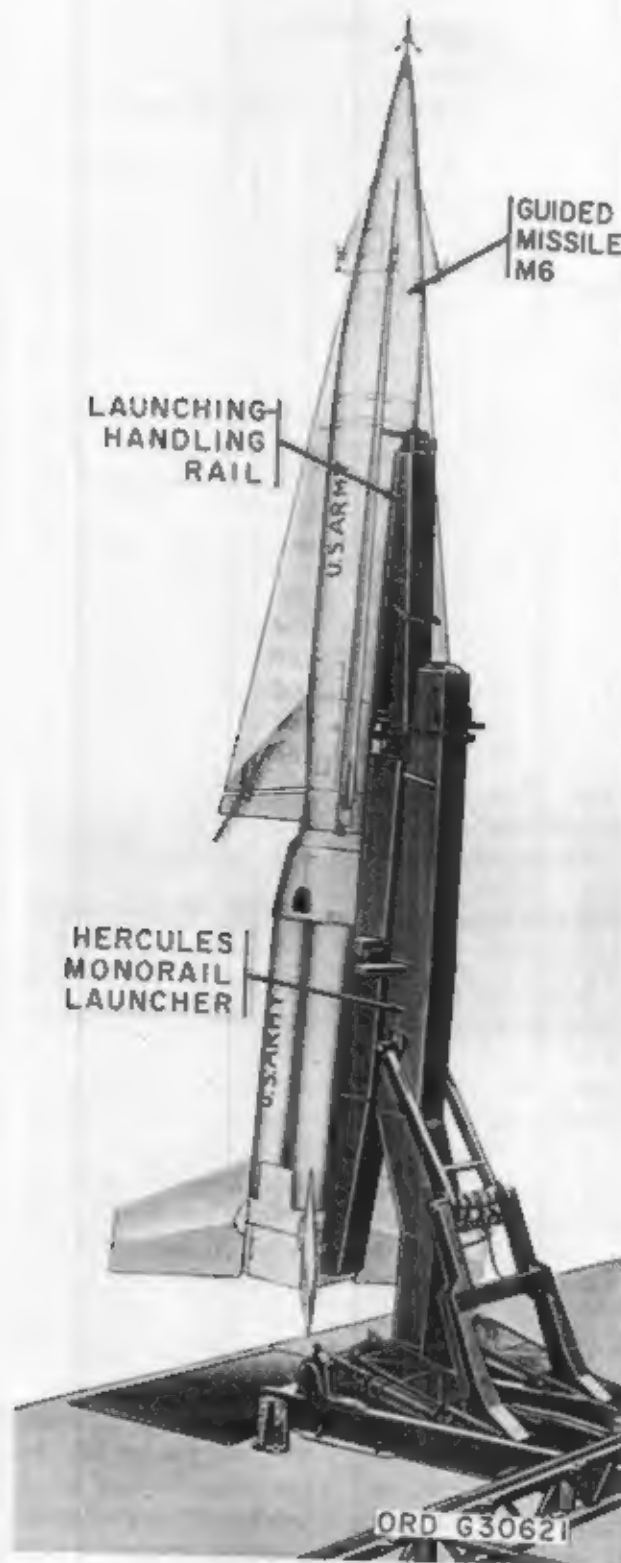
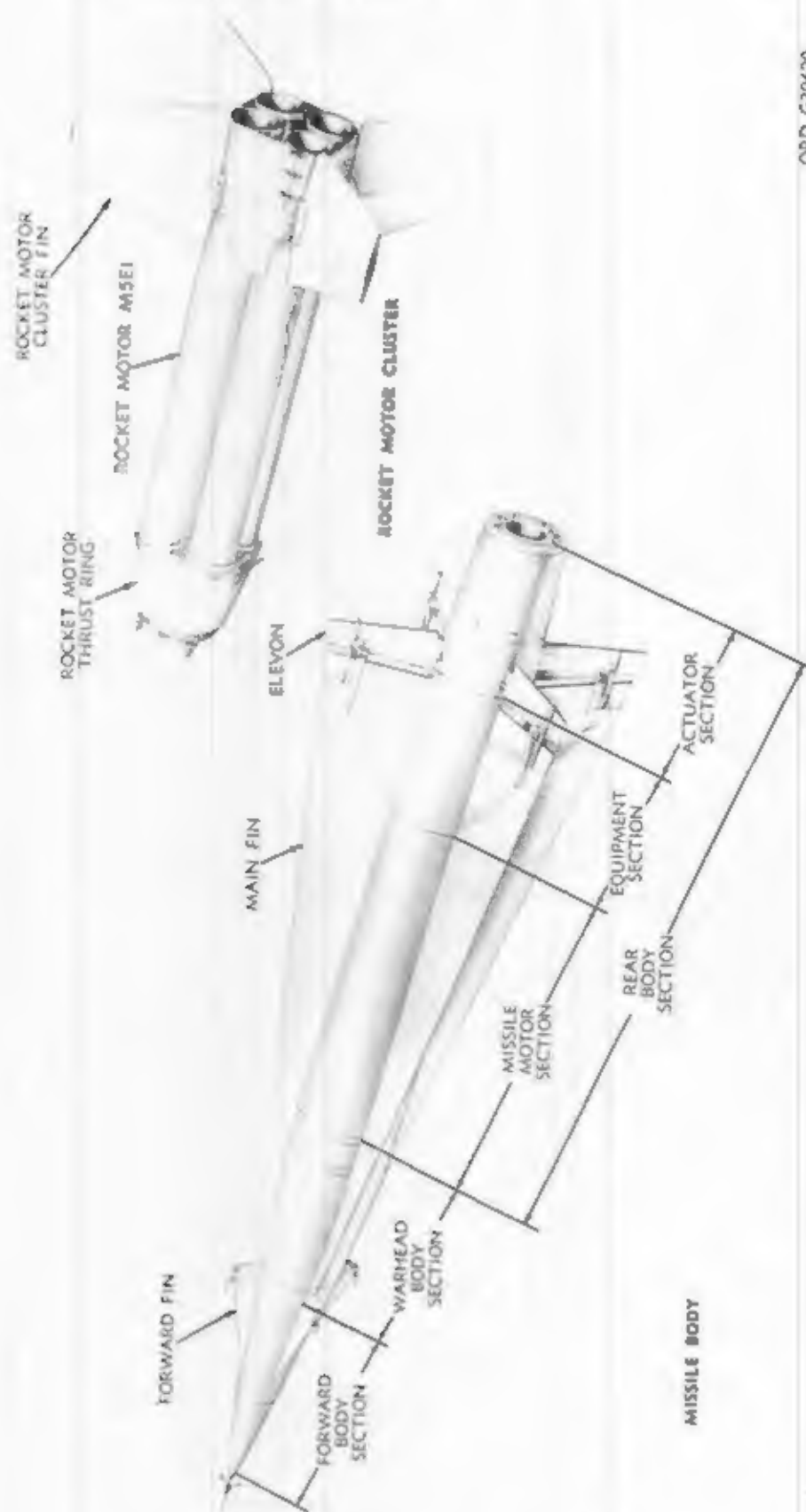


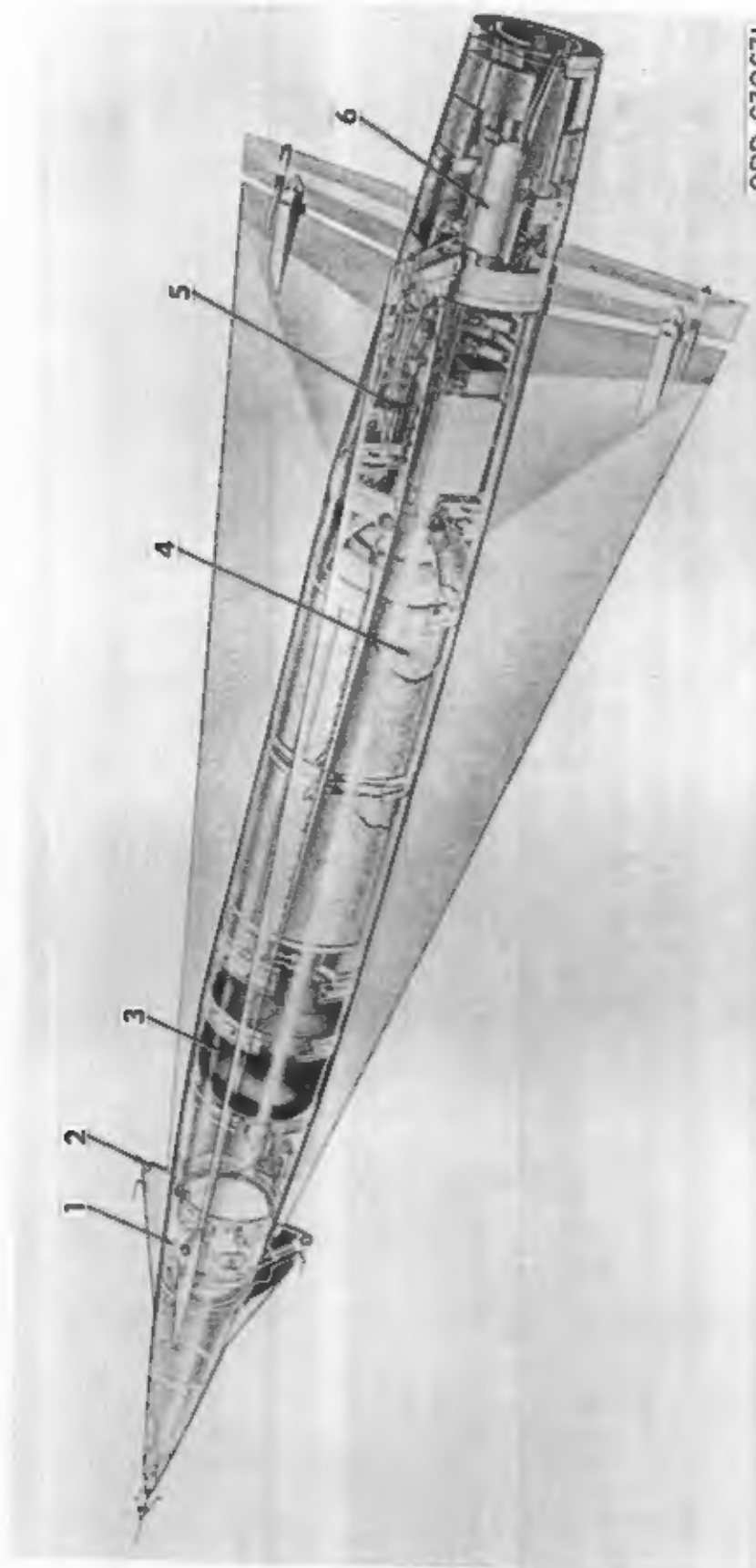
Figure 39 (U). Guided missile M6 on HERCULES monorail launcher.

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Figure 40 (U). Guided missile M6—major components

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1. Transponder-control group
2. Antenna horn
3. Warhead
4. Missile rocket motor M30
5. Accessory power supply
6. Blast tube

Figure 41 (U). Missile body — cutaway view.

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airfoil section permits quick response to guidance commands with minimum elevon deflection. The elevons are movable control surfaces on the trailing edges of the four main fins and permit control of the missile trajectory. Deflection of the elevons unbalances the lift forces produced by the main fins and causes the missile to rotate about the pitch, yaw, or roll axis, depending upon the combination of elevons deflected. The four rocket motor cluster fins, in conjunction with the main fins, stabilize the missile during the boost phase.

48 (CMHA). Missile Guidance System

a. General. The missile guidance system performs four main functions in controlling and detonating guided missile M6. First, it controls the missile trajectory in accordance with guidance commands (coded rf pulses) initiated by the computer system and transmitted to the missile by the missile tracking radar system. Second, it transmits an rf response pulse to the missile tracking radar system that enables the missile tracking radar system to track the missile. Third, it causes detonation of the missile warhead when a burst command is received. Fourth, it initiates fail-safe detonation of the warhead if ground guidance ceases or a malfunction occurs within the missile. The missile guidance system consists of four functional groups of circuits as shown in figure 42. They are the receiving and decoding circuits, steering control circuits, transmitting circuits, and command and fail-safe detonation control circuits.

b. Receiving and Decoding Circuits. Guidance commands in the form of coded rf pulse groups are transmitted by the missile tracking radar system, received at the missile by two receiving antennas, and applied to the receiving and decoding circuits. These circuits receive, amplify, and convert the coded rf pulse groups into video pulses. Video pulses pro-

duced by correctly coded rf pulse groups are decoded and applied to the steering control circuits as dc steering voltages. Video pulses produced by incorrectly coded rf pulse groups are rejected. This minimizes enemy interference and prevents the missile from responding to guidance commands intended for other missiles. The receiving and decoding circuits also produce a modulator trigger pulse each time a guidance command is received and decoded and apply this pulse to the transmitting circuits.

c. Transmitting Circuits. The transmitting circuits use the modulator trigger pulse to produce rf response pulses that are transmitted by the two transmitting antennas. When received by the missile tracking radar system, the response pulses complete the ground-air-ground link and thereby provide accurate missile tracking information. The transmitting circuits also produce hold-off pulses that are applied to the fail-safe detonation control circuits.

d. Steering Control Circuits. The steering control circuits consist of seven flight-control instruments and three steering amplifiers. These circuits receive the dc steering voltages from the receiving and decoding circuits and, in conjunction with feedback voltages developed by the flight control instruments, control operation of the elevon actuator assemblies to produce the appropriate elevon deflections. The flight control instruments enable the missile to respond smoothly to steering orders.

e. Command Detonation and Fail-Safe Control Circuits. The computer command circuits initiate detonation of the warhead by sending a burst command to the missile by way of the missile tracking radar system. Upon receipt of the burst command, the command detonation control circuits activate the warhead detonation devices. In a surface-to-surface mission, the burst command does not detonate the war-

head. Instead, the burst command arms the barometric fuze, which detonates the warhead at preset altitude above the target, and disables the fail-safe circuits. The fail-safe con-

trol circuits operate if ground guidance ceases or if a malfunction occurs within the missile. Should either condition prevail for approximately 2 seconds, causing interruption of

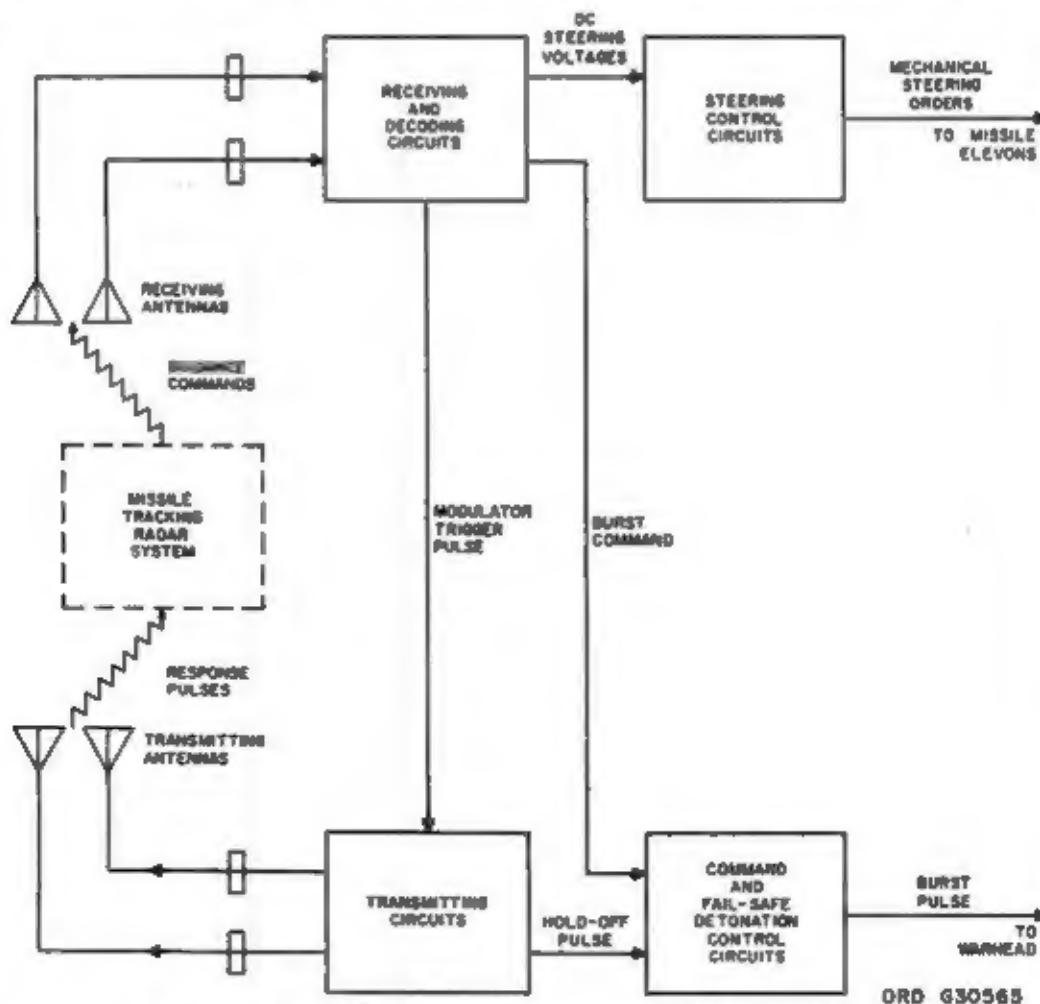


Figure 48 (U). Missile guidance system—functional block diagram.

the hold-off pulses from the transmitting circuits, the fail-safe circuits cause automatic destruction of the missile.

49 (U). Hydraulic System

The hydraulic system consists of three actuator assemblies, a mechanical linkage, and an

accessory power supply or hydraulic pumping unit. The actuator assemblies are electrically controlled by the steering orders from the missile guidance set and, by means of the mechanical linkage, produce the appropriate deflections of the elevons to maneuver the missile.

Hydraulic power to the actuator assemblies is supplied by an accessory power supply (APS) in some models and by a hydraulic pumping unit (HPU) in other models. The APS uses an ethylene oxide decomposition reaction turbine to drive a hydraulic pump. The HPU uses a squib-activated battery to power a dc motor which drives a hydraulic pump.

50 (CMHA). Propulsion System

a. The propulsion system consists of the rocket motor cluster and missile rocket motor M30. The rocket motor cluster contains four rocket motors M5E1 (fig. 40) that are ignited simultaneously approximately $\frac{1}{4}$ -second after the launch order to provide the initial (boost) thrust. Missile rocket motor M30 (4, fig. 41) is ignited after separation of the cluster to provide thrust during the controlled flight period. Both missile rocket motor M30 and rocket motor M5E1 are solid propellant motors.

b. At burnout of the rocket motor cluster, the greater aerodynamic drag of the cluster causes it to fall away (separate) from the missile body. Separation pulls a lanyard linking the cluster to the missile body. The lanyard activates thermal batteries that provide the current to ignite the initiators of missile rocket motor M30.

c. In a surface-to-air or surface-to-surface mission, the rocket motor initiators are ignited approximately $\frac{3}{4}$ -second after separation. In a surface-to-air low altitude mission, a motor start delay timer relay prevents the thermal battery current from igniting the rocket motor initiators until 9 seconds after liftoff. By means of the delayed motor start, missile velocity is reduced and a shorter turning radius and lower initial altitude are obtained.

d. Firing of the missile rocket motor initiators is prevented before the boost period by a safety and arming switch which applies a short circuit across the initiators and opens the circuit from the thermal batteries. During the boost period, the force of acceleration arms the switch, thereby removing the short circuit from the initiators and completing the circuit from the thermal batteries.

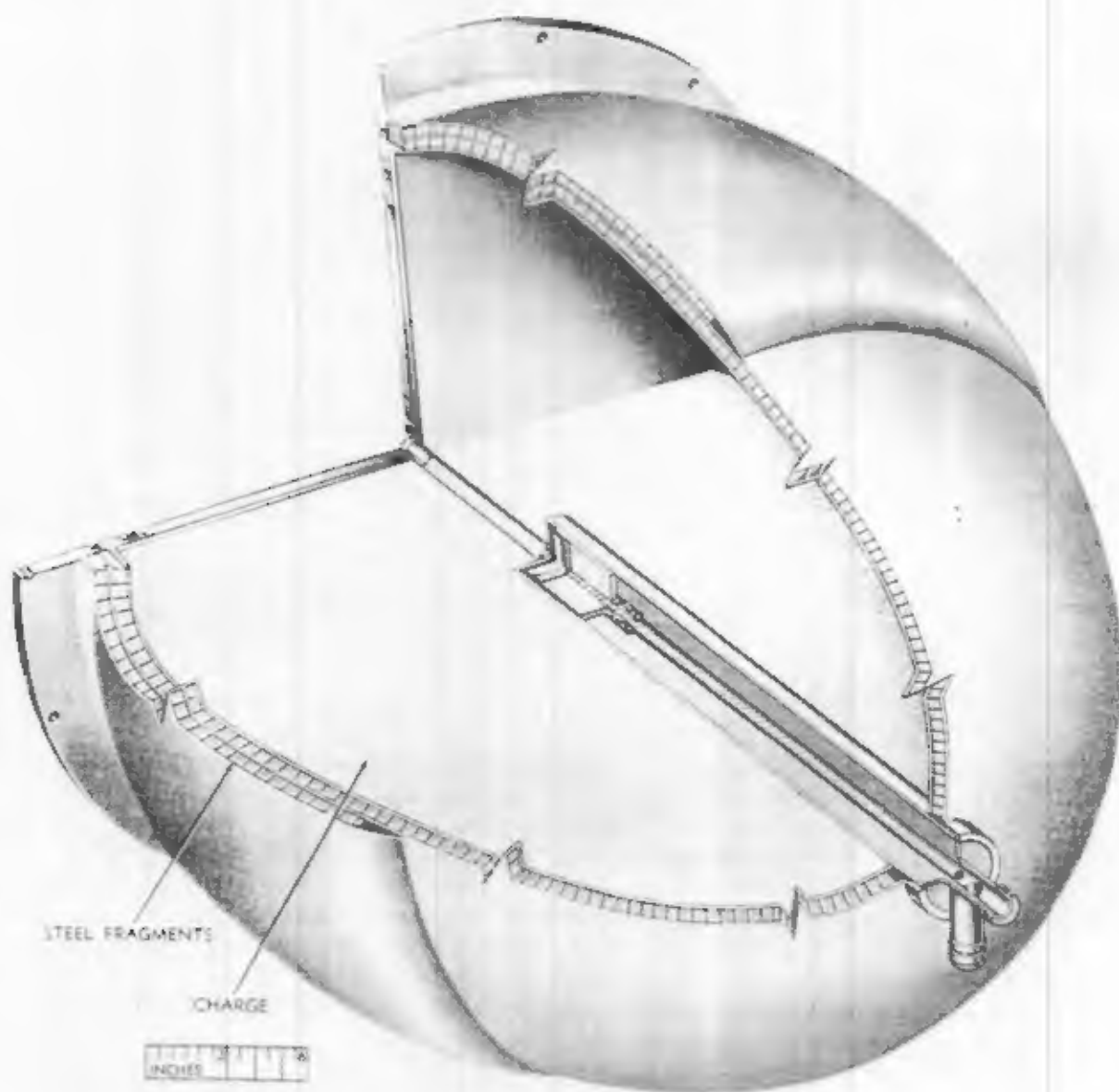
e. The rocket motor cluster produces 173,600 pounds of thrust and has a burn time of 3.4 seconds. Missile rocket motor M30 produces 13,500 pounds of thrust and has a burn time of 29 seconds.

51 (CMHA). Warhead System

a. The family of warheads to be used with guided missile M6 includes one fragmentation (warhead T45) and two nuclear types. Information on the nuclear warheads is not presented in this manual because of the security classification of this material.

b. Warhead T45 (fig. 43) consists of approximately 20,000 cubical, 140-grain, steel fragments arranged in single and double layers around a 625-pound explosive charge and a warhead booster. Detonation of the warhead is initiated by a burst pulse from the missile guidance set. The burst pulse ignites a small explosive charge in two safety and arming devices M30A1. These charges ignite two explosive harnesses M38. The explosive harnesses detonate the warhead booster which in turn detonates the warhead charge. The safety and arming devices M30A1 cannot be fired until they are armed by the force of acceleration during the boost period. The fragment distribution (blast pattern) of warhead T45 (fig. 44) is approximately spherical with a conical dead zone to the rear.

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Figure 43 (CMHA). Warhead T45 — cutaway view.

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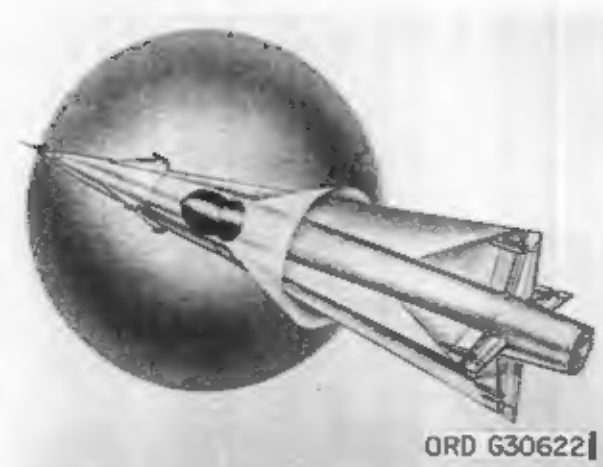


Figure 44 (CMHA). Warhead T45 — blast pattern.

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